AGRICULTURAL Research

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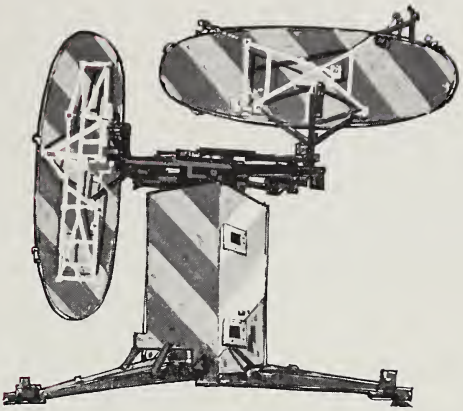

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AGRICULTURAL
Research

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The Research Challenge

USDA's 5-year outlook is being studied by the Nation's farmers and agricultural leaders for apparent adjustments that will have to be made to meet changing consumer preferences.

Five years hence, the number of U.S. farms will have declined to around 3 million units. Each farmer now shoulders the responsibility of producing for himself and 28 others, and this responsibility is growing.

By the end of 1968, the population will have increased an estimated 10 to 11 percent. This means 18 to 20 million more Americans. But more significantly, we will have a higher proportion of older and younger citizens to feed and clothe.

These are sobering thoughts. They can be translated, for example, into a need for more protective foods for older and younger people. Meat, milk, eggs, fruits, and vegetables—those high in proteins, vitamins, and minerals—best provide these nutrients. But, they are also costly foods to produce and process.

Here, then, is a double-barreled challenge: First, to produce these high-quality, protective foods in the amounts needed—and, second, to produce them at low enough cost to assure fair returns to farmers and reasonable prices to consumers.

The 5-year outlook projects net income of farm operators in 1968 at a level 9 percent below 1962.

This is one of several dilemmas facing producers and their supporting agricultural research agencies—both public and private.

We also urgently need better methods of conserving soils and using available water supplies . . . milk with more nonfat solids . . . eggs that retain their initial high quality . . . fruits and vegetables that are more suitable for freezing and canning . . . and field crops with qualities especially useful to industry.

We need more economical and effective methods of controlling diseases, insects, weeds, and weather . . . and better fertilizer practices and machines and other production tools. And, we must integrate these improvements into economical farm operations that stay flexible enough to allow adjustments in response to market demands.

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Orville L. Freeman, Secretary,
U.S. Department of Agriculture

B. T. Shaw, Administrator,
Agricultural Research Service

The nonflammable emulsion, applied quickly and easily, is sprayed on concrete to test its effectiveness against freeze-thaw scaling.

Toward Lower Cost, Better Highways

LINSEED-OIL TREATMENT FOR CONCRETE

■ Use of linseed oil for treating concrete may provide a means of cutting costs of street and highway construction and maintenance and open new market outlets for this flaxseed oil.

Concrete specimens cured with experimental compositions containing up to 97 percent of linseed oil have shown greater strength than specimens cured with various commercial materials.

The linseed-oil compositions emulsify easily in water. They were formulated in research by ARS chemists W. L. Kubie, J. C. Cowan, and L. E. Gast at the Northern utilization research laboratory, Peoria, Ill., as part of a broad effort by ARS to find new uses for farm crops.

The laboratory is providing samples of the compositions and details of the concrete-curing evaluations to highway departments, research organizations, oil processors, and others for further testing or developmental work.

Commercially feasible agents

The evaluations, carried out by engineers C. H. Best and C. H. Scholer of Kansas State University as one part of a research contract with ARS, indicate that commercial development of linseed-oil curing agents is feasible.

Evaluation of the experimental compositions to protect concrete against surface scaling due to freezing and thawing, another part of the contract, is still underway. This freeze-thaw scaling, or spalling, increases when salt is used to melt ice and snow.

The Peoria scientists set out to find a safe, low-cost linseed-oil composition that could be mixed with water and sprayed on concrete as a curing or anti-spalling agent or both. Typical among the compositions they prepared is one that contains 100 parts by weight of linseed oil, up to 3 parts of an alcohol as emulsifier, and a

The new compositions can be mixed with water on location—an important cost-saving feature. Chemist W. L. Kubie (left) is assisted by D. C. Rogers in preparing one of the test linseed-oil emulsions.

small amount of a stabilizing agent.

When an emulsion containing one of the experimental compositions is applied to concrete, the linseed oil forms a film barrier that slows the movement of water from fresh concrete or into cured concrete. A low rate of water loss from fresh concrete is critical in strength development. And in the case of cured concrete, water penetration—followed by alternate freezing and thawing—is the cause of spalling.

Various materials now used to slow this movement of water contain flammable solvents, resins, and waxes. The waxes must be removed from highways before traffic paint can be applied. Some curing is done with layers or sheets of solid materials, which also must be removed.

Inexpensive and nonflammable

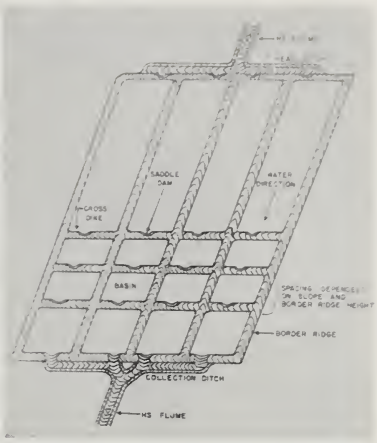
Emulsions of the new linseed-oil compositions in water would be inexpensive and nonflammable. The compositions could be mixed with water at the site of use and sprayed on the concrete. Costs of transporting and handling them would be lower than for ready-mixed solutions or solid materials.

In the Kansas curing evaluations, the new compositions were mixed with equal volumes of water and applied to specimens of fresh concrete. After 28 days, the specimens were tested for strength and compared with specimens cured with various commercial materials.

To evaluate the experimental compositions as anti-spalling agents, the Kansas scientists are applying emulsions to air-entrained concrete, a kind that is used in most modern highway construction. In dual-purpose evaluations, concrete cured with the experimental compounds will be exposed to freeze-thaw conditions to determine the anti-spalling protection obtained through use of the emulsions.☆

Salinity

Preparing Fields for Leaching



TOP LEFT—After leaching basin has filled, water flows over saddle dam into next basin. TOP RIGHT—Diagram shows field layout of dikes that form water basins. The distance needed between rows of cross dikes to govern water flow depends on the field's slope and border ridge height. BOTTOM—Tractor-drawn leveler is used to smooth field and form ridges.

■ Western farmers can reclaim many salt-damaged fields that are now unproductive or abandoned by using an inexpensive method of land preparation developed by an ARS engineer.

Ordinarily, heavy earthmoving equipment must be contracted for at $50 to $200 per acre to level entire fields uniformly for reclamation by proper irrigation-water management. Fields thus prepared may be leached by over-irrigation when necessary for reducing salinity.

But ARS agricultural engineer Sterling Davis says farmers, using their own or rented equipment, can prepare land for leaching at about a tenth of the cost of contracting for leveling to bring entire fields to uniform grade.

Ridges follow slope

Davis employs a series of small, sloping basins (see diagram). Border ridges like those used by irrigators are built 25 feet apart and parallel to the direction of field slope. Cross dikes, at right angles to the border ridges, are spaced just far enough apart so that water will cover the enclosed area before it flows over the cross dike into the basin below. On Billings silty clay loam soil with a 1-percent slope, cross dikes were 40 to 50 feet apart.

Erosion is avoided since water passes from one leaching basin to the next over pieces of canvas, or saddle dams, placed in depressions in the cross dikes. Water from all leaching basins is collected at the lower end of the slope and is diverted to a drainage ditch.

The area to be leached is first plowed or disked as for planting. Then the farm-sized leveler smooths the field in two or three directions. (Many farmers with large irrigated acreages own such levelers, and some soil and water conservation districts rent them to farmer-cooperators.) The border ridges are formed first; then the cross dikes and saddle dams are installed.

In cooperative experiments with the Colorado Agricultural Experiment Station near Grand Junction, Colo., Davis had no difficulty applying leaching water to a field prepared in this manner. Little additional labor was required after the borders, cross dikes, and saddle dams were in place.

Davis applied 30.3 inches of water in 90 days the first year of the experiment and 27.8 inches in 116 days the second year. Twenty-four to 48 inches of water are generally required for leaching salt from soil in the Grand Junction area.☆

The sterility principle offers expanded opportunities for eradication programs that cause . . .

Self-Annihilation of Insects

■ A broad-based research effort is underway to forge the sterile-male eradication technique into a weapon that can be trained on a wide range of man's insect enemies.

This tactic first evoked wide recognition when it wiped out the screwworm in the Southeastern United States. More recently, it rid the island of Rota of the melon fly. But spectacular as these victories are, they only denote highlights in an extensive and continuing program built upon years of research by entomologists who envisioned artificially induced sterility as a way to eradicate insects.

Now ARS is intensifying its efforts to explore the possibilities of the sterility principle. Since resources are limited, this work has been pushed forward ahead of other worthy research.

Two variations of the sterility principle are being investigated:

- Rearing large numbers of insects, sterilizing them with radiation, and releasing them to intermix with the native population. This is known as the sterile-male release method.
- Sterilizing insects in the natural population with chemicals called chemosterilants.

Success grows as population drops

The main value of the sterile-male release method comes from its use against an insect population that is low. This method becomes increasingly effective as the natural population declines; with conventional control methods, the opposite is true. Thus, for many pests the sterile-male release method, combined with one that is conventional, may provide more effective control than either method used alone.

ARS scientists are broadening their efforts to adapt the sterile-male release method for species other than the screwworm. First, they are determining the best way to sterilize a given species—whether by gamma radiation (the method used against screwworms) or by chemosterilization. Second, they are gathering data on the proper radiation dosage levels and the best life stage for treating each species that tests show can be sterilized by this method.

Although more research is needed on inducing sterility, it now appears that producing reasonably competitive sterile insects is not a serious obstacle to developing the sterility principle for wider use.

Radiation always lessens sexual vigor, but this reduction varies greatly with the species. The sexual vigor of some species, for example, is not so impaired that sterilized males cannot compete successfully with untreated males; the vigor in other species is so diminished that this control technique is of little value.

LEFT—Scientist observes breeding habits of screwworm flies in basic work on sterile-male technique. BELOW—Male (left); female (right).

Among the insects that can be radiated and sterilized in the pupal stage without serious adverse effects are screwworms, tropical fruit flies, and codling moths. In contrast, radiation applied in the pupal stage will drastically affect sugarcane borers, gypsy moths, and European corn borers. Effects are less damaging, however, when the radiation is applied in the adult stage.

Chemicals may outdo radiation

Chemicals may prove better than radiation for sterilizing some insect species. Findings thus far indicate that chemosterilants could be used against the housefly, several species of mosquitoes, several tropical fruit flies, Drosophila fruit flies, codling moth, pink bollworm, boll weevil, tobacco budworm, tobacco hornworm, and others.

Using chemicals to sterilize insects in the natural population holds great promise for more effective control or eradication—but this variation of the sterility principle is still in the development stage. One advantage of chemosterilization is that it would obviate expensive rearing and releasing operations. And, more important, it would provide a way to attack certain species that cannot be released in large numbers because of possible objections by the public, temporary damage to crops, or spread of insect-borne diseases.

Sterilizing insects in the natural population, compared with conventional control methods, has an inherent double-barreled effect:

1. Sterilizing a given portion of a pest population is equivalent to destroying that portion, so far as its reproductive potential is concerned.

2. As sterilized insects compete for mates, they reduce the reproductive potential of the remaining unexposed insects.

Thousands of chemicals have been screened for their sterilizing activity. Many compounds have some adverse effect on insect reproduction, but only a small percentage have potential value as insect-control agents.

Feeding to test effects

A technique found convenient in screening programs is to incorporate a specific amount of the candidate chemical in the diet of adult insects, then observe its effect on fertility and the ability to reproduce. However, since insects differ in structure, behavior, feeding mechanisms, and habits, feeding may not always be the most feasible method of administering the chemosterilant. Other methods are also being explored.

Some chemosterilants, applied so as to leave residues in areas frequented by insects, can be highly effective. These materials, which sterilize insects on contact, could be especially useful against sucking insects and insects that do not feed as adults.

Basic studies are needed

Before they can fully develop and test the sterility principle, scientists need more basic information on many aspects of each target insect, such as its biology, ecology, behavior, genetics, and rate and distance of spread. This information is generally lacking—even for some of the highly destructive pests that have been the subject of research for many years.

Diligent research continues, and scientists are optimistic that application of the sterility principle will one day become a major weapon in the war against insects.☆

Sterile screwworm flies are loaded on planes for systematic release in the Southwest, where an extensive eradication campaign is underway.

Tracking Thunderstorms

Late on a summer afternoon, ARS engineering technician Robert Wilson intently studies the rotating hand of a radar oscilloscope. As he watches a white blip slowly moving across the scope, he checks its location from the concentric range circles and determines its position on a similarly marked map of the area.

When the blip approaches the part of the map enclosed in a black line, Wilson consults with ARS hydraulic engineer K. G. Renard, who studies the map a moment, then nods in agreement.

Renard turns to a radio transmitter and contacts two distant work parties. He orders one truck to proceed immediately to a recording rain gage about 7½ miles from his headquarters at Tombstone, Ariz. He tells the other crew to be at a stream-gaging station 4½ miles away within a half hour.

■ A sequence of events somewhat like this took place last summer whenever a thunderstorm crossed the Walnut Gulch Experimental Watershed, a 58-square-mile research area in southeastern Arizona.

The radar set, salvaged from a B-50 bomber, and two-way radio equipment, once used by Federal Bureau of Investigation agents, are aiding in collection of data for research that will benefit 500,000 square miles of the arid and semiarid Southwest.

Water is a legal matter

Studies at Walnut Gulch are providing urgently needed information on effects of range conservation efforts on water and sediment yields. Irrigators and municipalities in the West hold legal rights to given amounts of water from streams, provided they put this water to beneficial use. In a chronically water-short area, they are concerned about any action—including conservation measures—that might affect the quantity or quality of water in streams.

Engineers and scientists at Walnut Gulch, directed by ARS agricultural engineer R. V. Keppel, are determining what influences water runoff and sediment production on semiarid watersheds. Their research is also supplying needed information on rates and amounts of runoff from these watersheds for designers of reservoirs serving stockmen, irrigators, and cities. Data on peak rates of runoff are used by builders of highway bridges, storm sewers, and flood-detention structures.

Before the radar and radio equipment was installed, the engineers were handicapped by the inability to determine the exact location of thunderstorms in time for crews to reach measuring stations. Typical thunderstorms cover no more than 4 square miles but are very intense—as much as 2 inches of rain may fall in 15 minutes.

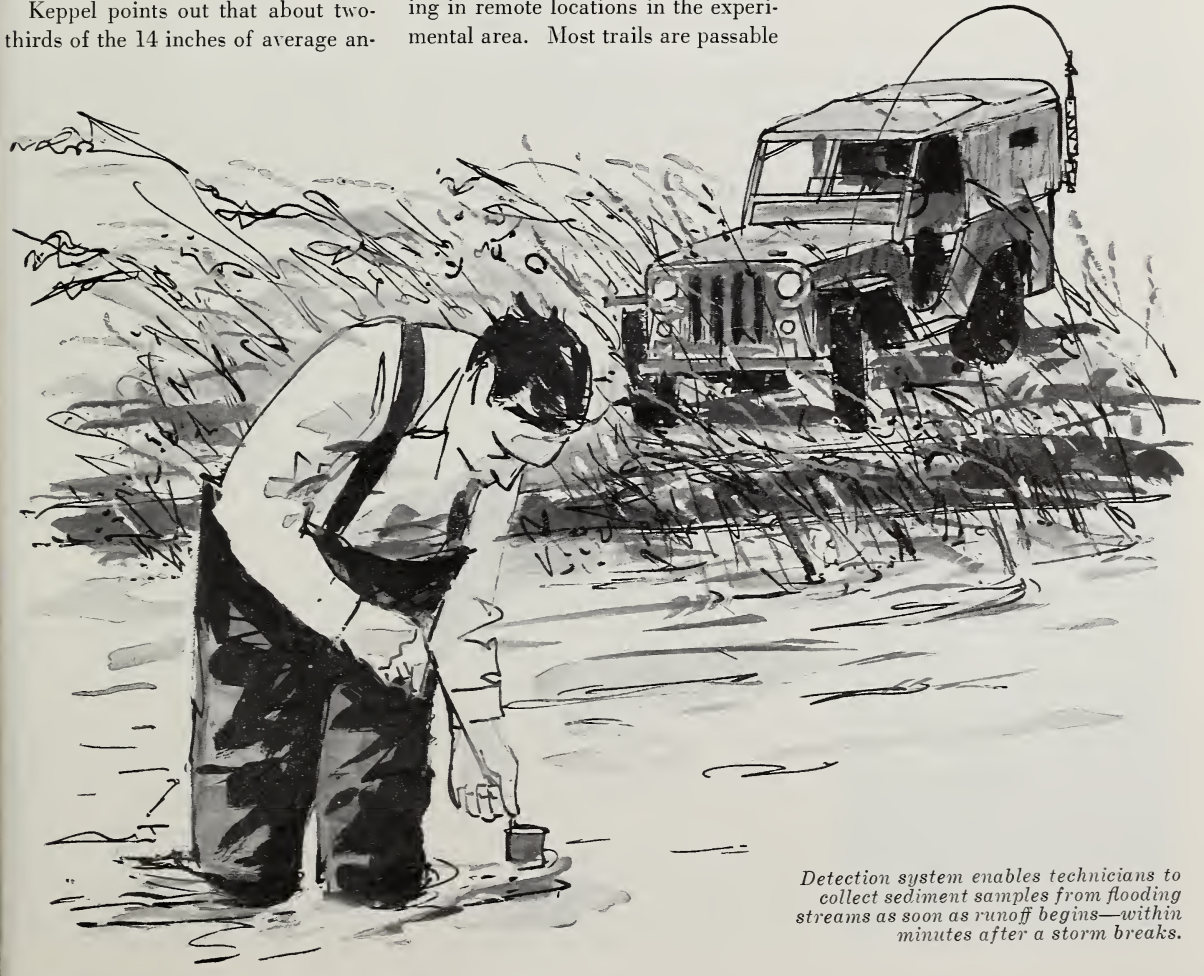
Technicians can now collect information from a higher proportion of storms crossing the watershed. Crews can be at stream-gaging stations to collect suspended sediment samples from the beginning of runoff, even though runoff starts within 10 minutes after rain begins to fall.

Reduces instrument failure

Radar tracking of storms has made it possible to reduce by about 10 percent the number of malfunctions by recording rain gages and automatic water-level recorders. Personnel now reach these instruments in time to see that they are functioning before rains begin.

Keppel points out that about two-thirds of the 14 inches of average annual rainfall occurs during four or five summer thunderstorms. Failure to collect information on one storm would seriously limit the usefulness of a season's data from that location.

The radio equipment also contributes to the safety of personnel working in remote locations in the experimental area. Most trails are passable only by four-wheel-drive vehicles, and stream crossings are flooded after showers. Now workers keep in contact with their headquarters and with other vehicles by radio and can call for help if trouble arises.☆



Detection system enables technicians to collect sediment samples from flooding streams as soon as runoff begins—within minutes after a storm breaks.

Stream channel erosion may be caused by complex, subtle network of conditions that influence soil stability.

Investigating

Stream Channel Erosion

■ Streambeds and banks composed of cohesive materials erode—sometimes rapidly, sometimes slowly. Why?

This erosion has been charged to the effects of slope and shape of channel and to the velocity and amount of the water moving through it. But the characteristics of the materials forming the channel also influence erodibility, and these characteristics are only now being precisely defined.

Same soil varies in stability

Research by ARS soil scientist E. H. Grissinger is beginning to unravel the complex reasons why some cohesive soils are more erodible than others, and why the same soil is more stable at certain times than at others.

Knowledge of the resistance of stream channel materials to erosion could reduce the cost of many drainage channels and spillways for dams. If tests showed that the channel could stand considerable force from running water without erosion, channels could be built narrower and steeper, with correspondingly less expense for earthmoving.

Soils containing clay tend to be cohesive—to stick together—whereas sandy soils containing little or no clay are loosely held and erode easily. Grissinger's investigations are limited to cohesive materials.

Working at USDA's Sedimentation Laboratory, Oxford, Miss., in cooperation with the University of Mississippi and Mississippi State University, Grissinger has identified six characteristics that influence stability (resistance to erosion) when water passes through the channel: Temperature of the eroding water, type of clay in the soil, amount of clay, orientation of clay particles, density of the soil, and the soil's antecedent moisture content.

Grissinger measured the erosion rate of more than 1,200 samples of test soils of known varying composition and condition in a small flume. These measurements are enabling him to pinpoint the complicated interrelationships among characteristics that influence soil stability.

The influence of eroding-water temperature, the scientist found, is largely independent of soil characteristics. The same soil is eroded more easily by warm water than by cold water.

The soil characteristics function in combination with one another, Grissinger reports. Some combinations produce an easily erodible soil condition; others contribute to stability.

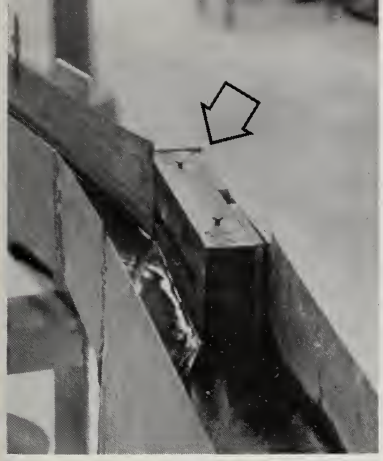
The type of clay determines the general cohesiveness of soil. It also limits the influence of antecedent moisture (how wet the soil was when subjected to flowing water) and the orientation of clay particles (whether the thin, flat clay crystals are (1) oriented, i.e., neatly stacked upon each other like pages in a tablet, or (2) unoriented, i.e., scattered and unorganized).

Grissinger tested two of the principal groups of clay minerals—kaolinite and montmorillonite.

Clay, density, moisture

Clay soils are generally more stable if they are dense and contain a high percentage of clay. The degree to which the percentage of clay and the density of the soil influence stability of the samples varies with the antecedent moisture content.

The influence of antecedent moisture on kaolinite clays apparently depends on whether the clay particles are oriented. In the case of oriented material, the wetter the soil when sub-



Water in test flume erodes soil contained in metal frame (arrow), set up to simulate stream bank.

jected to erosion, the more stable it will be. The opposite is true of unoriented material: stability decreases as antecedent moisture increases. In addition, small, unoriented kaolinitic clay particles are more stable than large unoriented particles as antecedent moisture is raised.

Results with other clay group

Montmorillonite soils with high percentages of clay or with unoriented clay particles appear to be more stable than those with lower clay percentages or oriented particles. Grissinger's research demonstrated that the montmorillonite clays are most stable with high antecedent moisture, provided the particles do not swell. The influence of bulk density on these clays seems to vary according to their chemical composition (exchangeable cations).

In future investigations, Grissinger will test his preliminary findings on naturally occurring soils of undetermined composition. He hopes eventually to develop tests for stream channel stability that can be used by USDA's Soil Conservation Service and other agencies.☆

Ferrets
Diets and Disposition

■ Changing the diet of ferrets can reverse their personalities—from snarling, biting demons to gentle, petlike animals.

Though bred in confinement, the ferret normally exhibits no affection, not even for its master. It is a wanton killer of poultry and has been known to attack children. The female, at times, devours her young.

Because the ferret is highly susceptible to canine distemper, scientists use it extensively to check the safety and potency of commercial distemper vaccines prepared to protect dogs and fur-bearing animals. Many ferrets are raised and used for this purpose at the National Animal Disease Laboratory, Ames, Iowa.

When these ferrets first arrived at NADL, they were so difficult to handle that their caretakers wore heavy leather gloves for protection. But after being fed a diet of 3 parts of fresh horse meat, 2 of dog meal, and 1 of fresh milk, the ferrets responded to good management and daily handling so that they could be cared for without gloves.

Cage care prompted diet change

That their diet played a key role in inducing this docility was not known until the caretakers were asked to raise the animals on a dry diet. This change was urged to remedy the cleanliness problem that a wet diet creates in cage rearing.

On the dry diet, the gentle ferrets grew fierce and intractable. A thorough check pointed to diet as bringing on the personality change. To verify this, a team headed by veterinarian A. G. Edward divided 92 ferrets into 2 experimental groups. Eighty were fed the full, normal (wet) ration, and 12 were placed on a limited, dry diet.

Became wild, then tame again

Experience in handling the animals showed that the full-fed group remained gentle and the limited-fed group became wild. When the wild ferrets were placed on the full, normal ration they became tame again.

The ferret, probably a native of Africa, is used in Europe for hunting rabbits and sometimes rats and mice. It looks like and belongs to the weasel family.☆

Handler Marvin Mortenson can vouch for the sunny side of a ferret's nature.

Imported fire ants feed on an unopened okra flower bud. These vicious pests are also a stubborn, elusive enemy of man and animals.

A BAIT FOR FIRE ANTS

New weapon advances eradication work in nine-State campaign area

Progress in State-Federal efforts to eradicate imported fire ants in nine Southern States is largely the result of an insecticide bait that was developed by ARS.

The bait is so effective that only a seventh of an ounce of the insecticide ingredient Mirex is required per acre for a treatment to kill the ants. It kills ants but does not leave any harmful residue.

All known fire ant infestations have been treated in 69 counties in the nine-State area. The State-ARS eradication effort is in effect in Georgia, Alabama, Arkansas, Florida, Louisiana, Mississippi, North Carolina, South Carolina, and Texas.

The new bait was used in 1963 on about 2 million acres where the fire ant, a native of South America, is a bothersome pest of humans, animals, and crops. The fire ant's toxic venom causes boil-like sores.

Mirex bait was tested extensively for 2 years before it was recommended for use in the present campaign.

The availability of the Mirex bait was largely responsible for the accelerated program last year. The scientists had worked steadily to find an effective bait—and to reduce the amount of insecticide needed to treat an acre.

Large mounds on a typically infested field damage farm machinery, pasturage.

Plus soy oil, corncob grits

The bait is a granulated mixture of Mirex, a chlorinated hydrocarbon insecticide; soybean oil, a food that appeals to the ants; and corncob grits, a carrier that makes it possible to distribute the other two ingredients evenly.

In treating infested areas, workers first apply Mirex bait to outlying areas and the outer limits of the general infestation, to prevent further spread of the ants. It is then applied to areas from the periphery inward to the highly infested areas.

Plant pest control officials say that, although the bait has proved successful, more than one application is necessary in some areas because of the mating habits of the ant.

After mating, the queen ant digs underground chambers to lay her eggs and establish a new colony. She feeds her brood from her own body reserve.

In an established mound, worker ants forage and carry food—including the Mirex bait—to the rest of the colony. Since a developing mound has no worker ants, the bait doesn't reach the new colony. This explains why more than one application may be necessary.

Further research is being conducted to determine the most effective timing for the applications.

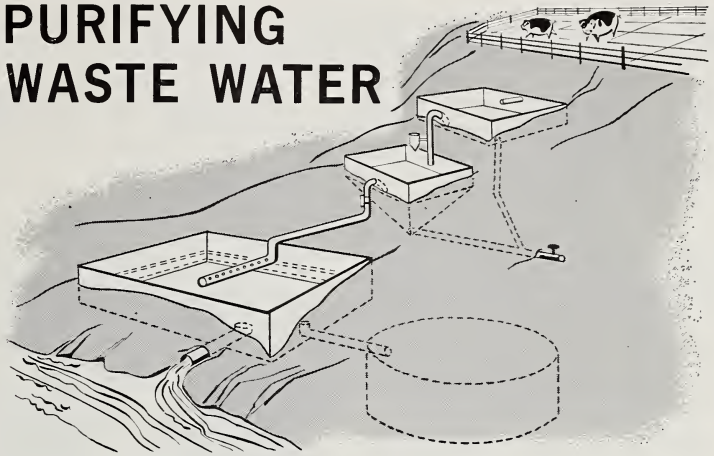
Spread jumped in 1950's

Imported fire ants entered the United States around 1918, with a shipment of goods from their native South America, and became established near Mobile, Ala. Their accelerated spread began in earnest in the 1950's. For food, they depend on plant roots, stems, seeds, tender shoots, and some insects.

The fire ants and their large mounds (see illustrations, below and at lower left) damage farm machinery and reduce the carrying capacity of pastures. Because of the ant's vicious sting, producers find it difficult to hire workers to harvest crops in infested fields.☆

Well-established mounds may be as much as a foot high. In contrast to developing mounds, these established mounds have worker ants which forage for food and carry Mirex bait to the rest of the colony.

PURIFYING WASTE WATER



Three-phase purification process starts in top tank; clean water drains into stream or is piped to underground storage tank.

A system for purifying waste water from livestock pens is being developed by an ARS agricultural engineer in cooperation with the University of Maryland, College Park.

The system will (1) make it possible to reuse farm waste water—a key need in water-scarce areas—and (2) clean up waste water so that, if discarded, it will not pollute rivers, streams, or other water sources.

Engineered by H. J. Eby, the system is designed primarily for disposing of poultry, hog, and cattle manures. For example, the manure in a poultry house, used for confinement rearing, would be washed into an outside collecting tank.

Heavy materials settle to the bottom of the collecting tank. The liquid is siphoned into a treatment tank (see accompanying illustration), where calcium hypochlorite, an inexpensive chemical bleach, is added automatically. Here, more settling takes place; then the liquid is siphoned into a third tank, where it is filtered through an inexpensive fiberglass screen and about 24 inches of coarse construction sand.

The fiberglass filter removes most of the remaining solids and eliminates the need for changing the sand frequently. The filter can be replaced or washed and reused.

Purified water is drained from the sand filter tank into a sewer, stream, or other disposal system; if the water is to be reused, it is piped to a storage tank. Eby says reuse of such water should be approved by local health authorities.

The collecting and treatment tanks have a drain for drawing off the settled waste material, which can be spread on fields, buried, or disposed of in a manure lagoon.

So far, Eby has conducted only laboratory studies, but a plywood pilot model of the water purification system is now being built at the University of Maryland's swine research unit. He estimates treatment will cost about 25 cents per 1,000 gallons of purified water.

A bacteria count of an untreated sample of poultry waste showed 32,000 *Escherichia coli*, a common intestinal bacterium, per milliliter. A milliliter of treated water had only one or two bacteria.☆

Nearer...

A Tonic for Cut Flowers

■ New information on the mechanism by which ethylene oxide gas retards aging in cut flowers has been obtained in tests with King Cardinal carnations at the Agricultural Research Center, Beltsville, Md.

Small dosages of ethylene oxide appear to reverse the action of another gas, ethylene, which is associated with aging in plants, say plant physiologist Sam Asen of ARS and physiologist Morris Lieberman of the Agricultural Marketing Service.

Last year, the two scientists reported success in efforts to delay the opening of cut roses through use of ethylene oxide (AGR. RES., June 1963, p. 16). The new experiments with carnations help support their theory—that ethylene oxide counteracts the effects of ethylene.

Carnations were used in the new experiments because they are extremely susceptible to the effects of ethylene. Symptoms of ethylene damage, known to flower growers as "sleepiness," include incurving of the edges of the petals and eventual closing of the flower.

A high concentration of ethylene oxide—2,000 pm for a 24-hour period—is slightly toxic to carnations, early tests proved. If treated at the 1,000-ppm level, the third carnation (from left) would show no deterioration—in contrast to the others—instead of slight deterioration visible here (6 days after 2,000-ppm treatment). Others are (1) untreated, (2) prematurely aged by ethylene, (4) treated with 1 ppm ethylene, 2,000 ppm ethylene oxide.

Gas treatment lasted 24 hours

The carnations were placed in water in flasks and then put in the gas chamber and held for 24 hours at 72 degrees F. Some were exposed to a normal atmosphere, some to 1 part per million ethylene, some to 1,000 ppm ethylene oxide, and some to a combination of 1 ppm ethylene and 1,000 ppm ethylene oxide. After treatment, the flowers were removed from the gas chambers, placed in a laboratory where the temperature varied from 72 to 80 degrees, and evaluated.

Within 24 hours, only the carnations that had been exposed to the ethylene alone showed typical "sleepiness" symptoms; and within 3 days after treatment, this group had completely dried out. Carnations treated with 1,000 ppm ethylene oxide or a combination of 1 ppm ethylene and 1,000 ppm ethylene oxide did not exhibit these symptoms—indicating that ethylene oxide counteracted the adverse effect of ethylene. The untreated carnations and those treated with the combination of the two gases started to deteriorate after 6 days; those treated with ethylene oxide alone did not start to deteriorate until the 8th day.

Asen and Lieberman think that the action of ethylene oxide in reversing the effect of ethylene is somehow related to the water content of the flowers. Those carnations exposed to ethylene lost water rapidly, they point out. Ethylene oxide seems to halt this water loss, and the action of the gas is apparently associated with cell permeability.

Earlier tests in the carnation series showed that a higher concentration of ethylene oxide—2,000 ppm for 24 hours—was somewhat toxic to carnations (see illustration).

The research on ethylene oxide is still at an early stage, and much work must be done before a safe, effective technique might be developed for the florist industry.☆

Wet ginning would improve quality

Cotton, which is normally ginned at a moisture content of about 6 percent, may someday be ginned soaking wet.

At USDA's Cotton Ginning Research Laboratory, Leland, Miss., ARS physicist A. C. Griffin has learned that the wetter cotton fibers are, the stronger they are. Wet fibers break less readily that dry fibers as they are pulled from the seed, his tests show.

Griffin is now trying to determine the fiber moisture level at which cotton can be ginned with the least fiber breakage.

Reducing fiber breakage by ginning wet cotton would benefit the entire cotton industry. Broken (short) fibers lead to yarn breakage during spinning. Repairing yarn breaks raises processing costs and lowers the quality of yarn and fabric. And quality is a major factor in U.S. cotton's ability to compete with foreign cotton and domestic and foreign synthetics (AGR. RES., January 1962, p. 12).

Present commercial equipment will not gin wet cotton. But engineers at the Leland laboratory have ginned cotton experimentally in a water bath, using special equipment. Very few fibers broke during ginning under these conditions.

If the engineers are able to gin cotton at high moisture levels, present ginning equipment may have to be completely redesigned. The long-range returns from this changeover could more than offset the initial large investment.

Fibers are pulled from single cottonseed (at left) in this chamber Griffin built to test relative fiber strength. Fiber moisture is controlled through salt solution in glass dish.

Yearbook cites rural-urban ties

At a time when many important differences between city and country are disappearing from the American scene, rural and city residents are finding more interests in common.

A Place to Live, 1963 Yearbook of Agriculture, examines this changing scene in the light of urbanization and industrialization in the United States and relates it to living habits of all Americans.

The 79 chapters range from agriculture in the national economy to community leadership, from garden clubs to part-time farms, from conservation in the suburbs to farming on the urban fringe, from rural housing to finances in communities, and from planning and zoning to multiple uses of forests and other resources.

The 1963 yearbook is the latest in a series that dates back to 1849, when the Commissioner of Patents prepared the first annual report of his agency's work in agriculture.

Written in nontechnical, informative style, *A Place to Live* contains 608 pages contributed by 92 men and women, among them officials of State and Federal governments, college professors, garden club leaders, planning officials, sociologists, and economists.

A Place to Live is available for $3 from the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402.

Wood paneling simulates brickwork

USDA's Forest Service has designed a wood wall paneling that looks like bricks.

This new product, developed by the Central States Forest Experiment Station, can be used for home or office walls or for cabinet fronts, planters, doors, room dividers, backs of built-in bookcases, and around fireplaces.

The wood-brick strip paneling is tongue-and-grooved, like strip flooring. It can be quickly nailed over existing wall surfaces or directly to studding.

The brick effect is created by chamfering (beveling) the edges of the strips and cross-grooving the strip face at regular intervals. The chamfers and cross-grooves simulate the mortar; the flat surface, the face of the brick.

Numerous effects are possible by using different woods and finishes. Also, unusual effects can be created by changing the pattern of installation or by varying the size of the simulated bricks.

Because the paneling can be made from short, narrow strips, it offers a means of utilizing waste from manufacturing plants now making other wood products. It can be produced economically from No. 2 and No. 3A common lumber.

Flooring manufacturers could turn

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out strip paneling with little difficulty since there is only a slight difference between the faces of strip paneling and strip flooring. The face of the paneling has a chamfer along the edges and a V-groove that runs across the paneling at brick-length intervals.

The Forest Service is now experimenting with small thin pieces of wood—used as tile—for application with an adhesive.

Testing tobacco-leaf strength

How much punishment can a tobacco plant take before its market value is reduced?

The answer to this question will help ARS and Kentucky agricultural engineers in their development of a machine that harvests burley tobacco efficiently and with little or no loss in market value of the crop (AGR. RES., December 1963, p. 12). Tobacco is one of the few crops in the United States still produced almost entirely by hand.

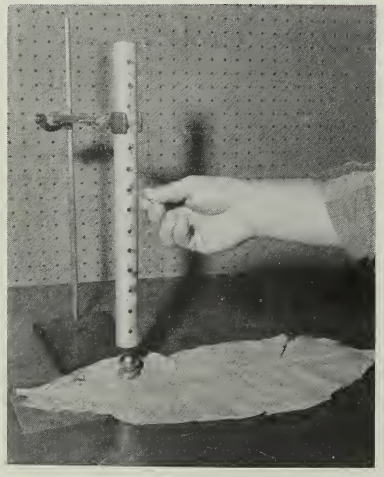
Since burley tobacco is harvested and cured on the stalk, a mechanical harvester must be able to harvest the crop without injuring the leaves or breaking them off the stalk.

In basic research underway at the University of Kentucky, Lexington, agricultural engineers J. H. Casada of ARS and S. W. Smith of Kentucky are applying forces, such as bending and twisting, to mature burley tobacco leaves—to learn as much as possible about their physical properties.

One test is designed to determine how much resistance to bruising the leaves have when static pressures are applied to them. Another test is designed to determine resistance to bruising when impact loads are applied to the leaves. Badly bruised tobacco does not cure properly and its market value is reduced.

The scientists also measure leaf flexibility. Leaves on the stalk are bent up, down, and sideways. Casada and Smith have found that leaves will bend upward until they touch the stalk without breaking but will not bend too far downward or to the side. This means that, if necessary, leaves could be bent upward against the stalk for mechanical harvesting.

Engineers drop steel ball from various heights to measure the smallest amount of impact that a leaf can stand before bruising. Extent of damage is determined after the leaf is completely cured.



Attractant for European chafer

An ARS-synthesized attractant for European chafers provides a case study on the value of specific lures.

This new attractant—butyl sorbate—proved superior in field studies that started in 1957, and it is now used in chafer-control programs in areas where Japanese beetles are known to occur.

A mixture of Java citronella oil and eugenol—also developed by ARS—has been the standard attractant for the chafer, but it also attracts Japanese beetles. In beetle-infested areas, therefore, traps baited with this mixture often become fouled with beetles.

Butyl sorbate equals or exceeds the standard lure both in ability to attract and in specific attractiveness to the European chafer, a pest of pastures, winter-grain crops, and turf. It was selected from 441 chemicals synthesized in an effort to develop a specific attractant for the chafer.

To detect infestations and determine the boundaries of infested areas, control workers use chemical-attractant traps in open areas and light traps near wooded areas or among scattered trees. The information obtained is the basis for treatment with insecticides on the outer limits of the generally infested area.

The European chafer was first discovered in this country in 1940 in New York. Although control efforts have delayed its spread, it has infested small areas in Connecticut, New Jersey, West Virginia, and Pennsylvania.

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